Form Approved
Budget Bureau No. 68-R0249

SECTION I

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

GRANT APPLICATION

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TYPE	PROGRAM	NUMBER
REVIEW GROUP		FORMERLY
COUNCIL (Month, Year)		DATE RECEIVED

TO BE COMPLETED BY PRINCIPAL INVESTIGATOR (Items 1 through 7 and 15A)

1. TITLE OF PROPOSAL (Do not exceed 53 typewriter spaces)
Techniques To Enhance Extraordinary Human Perception

2. PRINCIPAL INVESTIGATOR

2A. NAME (Last, First, Initial)
Targ, Russell

2B. TITLE OF POSITION
Senior Research Physicist

2C. MAILING ADDRESS (Street, City, State, Zip Code)
BLDG. 30, K1054
Stanford Research Institute
Menlo Park, CA. 94025

2D. DEGREE
B.S. Physics
Grad. Work, Columbia

2E. SOCIAL SECURITY NO.
[redacted]

SGFOIA3

2F. TELEPHONE DATA
Area Code: 415
TELEPHONE NUMBER AND EXTENSION: 326-6200 X3202

2G. DEPARTMENT, SERVICE, LABORATORY OR EQUIVALENT (See Instructions)
Electronics and Bioengineering Lab.

2H. MAJOR SUBDIVISION (See Instructions)
Information Science and Engineering Div.

3. DATES OF ENTIRE PROPOSED PROJECT PERIOD (This application)
FROM: Oct. 1, 1972
THROUGH: Oct. 1, 1973

4. TOTAL DIRECT COSTS REQUESTED FOR PERIOD IN ITEM 3
[redacted]

5. DIRECT COSTS REQUESTED FOR FIRST 12-MONTH PERIOD

6. PERFORMANCE SITE(S) (See Instructions)

SGFOIA2

Stanford Research Institute
333 Ravenswood Ave.
Menlo Park, CA. 94025
California 11

7. Research Involving Human Subjects (See Instructions)
A. ☐ NO B. ☐ YES Approved: ______ Date
C. ☒ YES – Pending Review

8. Inventions (Renewal Applicants Only - See Instructions)
A. ☐ NO B. ☐ YES – Not previously reported
C. ☐ YES – Previously reported

TO BE COMPLETED BY RESPONSIBLE ADMINISTRATIVE AUTHORITY (Items 8 through 13 and 15B)

9. APPLICANT ORGANIZATION(S) (See Instructions)
Stanford Research Institute
333 Ravenswood Ave.
Menlo Park, CA. 94025
California 11

10. NAME, TITLE, AND TELEPHONE NUMBER OF OFFICIAL(S) SIGNING FOR APPLICANT ORGANIZATION(S)
Philip J. O'Donnell
MGR., Contract Admin.

Telephone Number (s) (415) 326-6200 X2482

11. TYPE OF ORGANIZATION (Check applicable item)
☐ FEDERAL ☐ STATE ☐ LOCAL ☒ OTHER (Specify) International

12. NAME, TITLE, ADDRESS, AND TELEPHONE NUMBER OF OFFICIAL IN BUSINESS OFFICE WHO SHOULD ALSO BE NOTIFIED IF AN AWARD IS MADE
Emery F. Bator, Treasurer
Stanford Research Institute
333 Ravenswood Ave.
Menlo Park, CA. 94025
Telephone Number (415) 326-6200 X2022

13. IDENTIFY ORGANIZATIONAL COMPONENT TO RECEIVE CREDIT FOR INSTITUTIONAL GRANT PURPOSES (See Instructions)
Information Science and Engineering Div.
Stanford Research Institute 60

14. PHS ACCOUNT NUMBER (Enter if known)

15. CERTIFICATION AND ACCEPTANCE. We, the undersigned, certify that the statements herein are true and complete to the best of our knowledge and accept, as to any grant awarded, the obligation to comply with Public Health Service terms and conditions in effect at the time of the award.

SIGNATURES (Signatures required on original copy only. Use ink. "Per" signatures not acceptable)		DATE
	A. SIGNATURE OF PERSON NAMED IN ITEM 2A Russell Targ	7/27/72
	B. SIGNATURE(S) OF PERSON(S) NAMED IN ITEM 10	DATE

PHS-398
Rev. 3-70

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

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PROJECT NUMBER

RESEARCH OBJECTIVES

NAME AND ADDRESS OF APPLICANT ORGANIZATION

SGFOIA3

Stanford Research Institute
333 Ravenswood Ave., Menlo Park, CA. 94025

NAME, SOCIAL SECURITY NUMBER, OFFICIAL TITLE, AND DEPARTMENT OF ALL PROFESSIONAL PERSONNEL ENGAGED ON PROJECT, BEGINNING WITH PRINCIPAL INVESTIGATOR

Russel Targ [redacted] Senior Research Physicist
Electronics and Bioengineering Lab. of the Information Science and Engineering Div.

Harold E. Puthoff [redacted] Senior Research Engineer
Electronics and Bioengineering Lab. of the Information Science and Engineering Div.

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TITLE OF PROJECT

Research on Techniques to Enhance Extraordinary Human Perception

USE THIS SPACE TO ABSTRACT YOUR PROPOSED RESEARCH. OUTLINE OBJECTIVES AND METHODS. UNDERSCORE THE KEY WORDS (NOT TO EXCEED 10) IN YOUR ABSTRACT.

We propose to investigate the feasibility of enhancing ESP function using the following three approaches: (1) use of a teaching machine of ESP, incorporating the principle of reinforcement (4-stage random target selector); (2) training subjects to use ESP by means of hypnotic techniques; (3) testing the effect of Faraday cages on enhancing ESP performance

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Next 1 Page(s) In Document Exempt

BIOGRAPHICAL SKETCH

(... personnel listed on page 3, beginning with the Principal Investigator. Use continuation pages and follow the same general format for each person.)

NAME	TITLE	BIRTHDATE (Mo., Day, Yr.)
Russell Targ	Senior Research Physicist	[redacted]
PLACE OF BIRTH *(City, State, Country)*	**PRESENT NATIONALITY** *(If non-U.S. citizen, indicate kind of visa and expiration date)*	**SEX**
Chicago, Illinois U.S.A.	U.S.	☒ Male ☐ Female

EDUCATION *(Begin with baccalaureate training and include postdoctoral)*

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	SCIENTIFIC FIELD
Queens College, New York, N.Y.	B.S.	1954	Physics
Columbia University, New York, N.Y. 1954-56	-	-	Physics

HONORS

Awarded position of Research Assoc., Polytechnic Institute of Brooklyn, Brooklyn, New York, 1959

MAJOR RESEARCH INTEREST

Parapsychological and Paraphysical Phenomena

ROLE IN PROPOSED PROJECT

Responsible Investigator

RESEARCH SUPPORT *(See instructions)*

100% overhead, Stanford Research Institute, pending funding

SGFOIA3

RESEARCH AND/OR PROFESSIONAL EXPERIENCE *(Starting with present position, list training and experience relevant to area of project. List all or most representative publications. Do not exceed 3 pages for each individual.)* Prior to joining SRI in 1972, Russell Targ joined Sylvania in 1962 and was recently investigating techniques for the development of new gas lasers, making use of his recent research with compact, self-contained multi-kilowatt CO_2 lasers. He has pursued in the past research resulting from his original investigations of the FM laser and supermode laser techniques. This work has included frequency stabilization and single frequency operation of both He-Ne lasers and high-power argon lasers. He has worked on techniques for laser noise reduction by elimination of mode competition through use of the FM process. He also performed modelocking experiments using the high-power CO_2 laser at 10.6 microns to achieve very short pulses at high-power and high-repetition rates. Previous to this work, he was engaged in work on optical modulation and demodulation with microwave photo tubes and the design and construction of an automatic-frequency-controlled optical heterodyne receiver for the detection of microwave-modulated light.

Before coming to Sylvania, Mr. Targ was with Technical Research Group from 1959-1962. There he was involved in experiments in new gaseous laser media, spectroscopy for systems with gases involving collisions of the second kind, construction of He-Ne lasers in the infrared and visible ranges, and optical homodyne experiments using phase modulation and demodulation techniques.

Earlier, he served as Research Associate at the Polytechnic Institute of Brooklyn, where assisted in the establishment of the Electron Beam Laboratory. There, he performed experiments with high-density plasma, making use of microwave diagnostic techniques.

Prior to that (1956-1959), he had been with Sperry Gyroscope Company, Electron Tube Division where he did experimental work in microwave generation from plasmas; he is the inventor of the tunable plasma oscillator at microwave frequencies. He also did early work in the technology of ultrahigh-vacuum and ion-pump design.

PROFESSIONAL ASSOCIATION: IEEE, American Physical Society, The Optical Society of America

PUBLICATIONS: Mr. Targ has published numerous papers on beam-plasma interactions, spectroscopy for new gaseous lasers, optical-homodyne experiments, and laser stabilization.

LIST OF PUBLICATIONS

1. R. Targ and L.P. Levine, "Backward-Wave Oscillations in a System Composed of an Electron Beam and a Hydrogen Gas Plasma", Journal of Applied Physics, Vol. 32, No. 4, April 1961, pp. 731-737.

2. M. Ettenberg and R. Targ, "Observations of Plasma and Cyclotron Oscillations", Proc. of the Symposium on Electronic Waveguides, Polytechnic Institute of Brooklyn, New York, April 8-10, 1958.

3. P. Rabinowitz, S. Jacobs, R. Targ, and G. Gould, "Honodyne Detection of Phase-Modulated Light", Proc. IRE, Vol. 50, No. 11, November 1962.

4. G. Grosof and R. Targ, "Enhancement in Mercury-Krypton and Xenon-Krypton Gaseous Discharges", Applied Optics, Vol. 2, No. 3, March 1963, pp. 299-302.

5. R. Targ, "Optical Heterodyne Detection of Microwave-Modulated Light", Proc. IEEE (Correspondence), March 1964, pp. 303-304.

6. R. Targ, D.E. Caddes, and B.J. McMurtry, "The Traveling-Wave Phototube. Part II: Experimental Analysis", IEEE Transactions on Electron Devices, Fol. ED-11, April 1964, pp. 164-170.

7. S.E. Harris and Russell Targ, "FM Oscillation of the He-Ne Laser", Applied Physics Letters, Vol. 5, No. 10, 15 November 1964, pp. 202-204.

8. Russell Targ, G.A. Massey, and S.E. Harris, "Laser Frequency Translation by Means of Electro-Optic Coupling Control", Proc. IEEE, (Correspondence), Vol. 52, No. 10, October 1964, pp. 1247-1248.

9. Russell Targ and W.D. Bush, "Automatic Frequency Control of a Laser Local Oscillator for the Heterodyne Detection of Microwave-Modulated Light", Applied Optics, Vol. 4, No. 11, December 1965.

10. G.A. Massey, M. Kenneth Oshman, and Russell Targ, "Generation of Single-Frequency Light Using the FM Laser", Applied Physics Letters, Vol. 6, No. 1, January 1965, pp. 10-11.

11. L.M. Osterink and Russell Targ, "Single-Frequency Light from an Argon FM Laser", Applied Physics Letters, February 1967.

12. Russell Targ and John Michael French, "Stabilization of a He-Ne Laser", Proc. IEEE, July 1967.

13. L.M. Osterink and Russell Targ, "Single-Frequency Light Using the Super-mode Technique with an Argon FM Laser", Proc. of the Symposium on Modern Optics, Polytechnic Institute of Brooklyn, N.Y., March 22-24, 1967.

14. Russell Targ and L.M. Osterink, "Frequency Stabilization and Quieting of the FM Laser", 1967 WESCON Convention Record.

15. R. Targ and J.M. Yarborough, "Mode-Locked Quieting of the He-Ne and Argon Lasers", Applied Physics Letters, Vol. 12, No. 1, pp. 3-4, 1 January 1968.

16. D.E. Caddes, L.M. Osterink, and Russell Targ, "Mode-Locking of the CO_2 Laser", Applied Physics Letters, Vol. 12, No. 3, pp. 74-76, 1 February 1968.

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17. Russell Targ, J.M Yarborough, J.M French, "Frequency Stabilization and Noise Suppression in the Argon FM Laser", IEEE Journal of Quantum Electronics, Oct. 1968

18. William B. Tiffany, Russell Targ, and J.D. Foster, "Kilowatt CO_2 Gas-Transport Laser", Applied Physics Letters, Vol. 15, No. 3, 1969.

19. William B. Tiffany, and Russell Targ, "The Gas-Transport Laser--A New Class of High-Power Electro-Optic Devices", Laser Focus, September 1969.

20. Russell Targ and William B. Tiffany, "Gain and Saturation In Transverse Flowing CO_2-N_2-He Mixtures", Applied Physics Letters, Vol. 15, No. 9, 1 November 1969.

21. S.E. Schwarz, T.A. deTemple and Russell Targ, "High Pressure Pulsed Xenon Laser", Applied Physics Letters, Vol. 17, No. 7, 1 October 1970.

22. Joseph D. Taynai, Russell Targ and William P. Tiffany, "An Investigation of Tellurium for Frequency Doubling with CO_2 Lasers", IEEE Journal of Quantum Electronics, QE-7, 8 August 1971.

23. Russell Targ and M.W. Sasnett, "High Repetition Rate Xenon Laser with Transverse Excitation", IEEE Journal of Quantum Electronics, February 1972.

24. Russell Targ and Michael W. Sasnett, "Xenon-Helium Laser at High Pressure and High Repetition Rate", American Institute of Physics, Vol..19, No. 12, 15 December 1971.

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BIOGRAPHICAL SKETCH

(Give the following information for all professional personnel listed on page 3, beginning with the Principal Investigator. Use continuation pages and follow the same general format for each person.)

NAME	TITLE	BIRTHDATE *(Mo., Day, Yr.)*
Harold Edward Puthoff	Senior Research Engineer	[redacted]

PLACE OF BIRTH *(City, State, Country)*	PRESENT NATIONALITY *(If non-U.S. citizen, indicate kind of visa and expiration date)*	SEX
Chicago, Illinois U.S.A.	U.S.	SGFOIA3 [X] Male [ ] Female

EDUCATION *(Begin with baccalaureate training and include postdoctoral)*

INSTITUTION AND LOCATION	DEGREE	YEAR CONFERRED	SCIENTIFIC FIELD
Stanford University, Stanford, CA.	Ph.D.	1967	Physics, Electrical Eng
University of Florida, Gainesville, Fla	M.S.E.	1960	Electrical Engr.
University of Florida, Gainesville, Fla	B.E.E.	1958	Electrical Engr.

HONORS

Dept. of Defense Certificate of Commendation for Outstanding Performance (in connection wit supervision of optical computer research), 1963; Second Prize for Outstanding Paper of the Year, NSA Technical Journal, 1963, for contribution entitled, "The Status of Optical Logic Elements for Nanosecond Computer Systems", co-authored with [redacted] (cont. below*)

MAJOR RESEARCH INTEREST	ROLE IN PROPOSED PROJECT
Quantum Physics, Paraphysical and Parapsychological Phenomena	Co-investigator SGFOIA3

RESEARCH SUPPORT *(See instructions)*

100% overhead, Stanford Research Institute, pending funding

*Phi Eta Sigma Honorary Fraternity; J. Hillis Memorial Award for Outstanding Sophomore, University of Fla.,, 1956; J. Hillis Memorial Award for Outstanding Engineering Student, 195 Sigma Tau Honorary Fraternity; Phi Kappa Phi Honorary Fraternity; Sperry Fellow, 1958-1959; Sigma Xi; B. E. E. Degree with High Honors, 1958;

RESEARCH AND/OR PROFESSIONAL EXPERIENCE *(Starting with present position, list training and experience relevant to area of project. List all or most representative publications. Do not exceed 3 pages for each individual.)* In 1972, Dr. Puthoff joined the staff of SRI where he is continuing work in the area of lasers and also initiating research in the area of biofeedback and biofield measurements. Dr. Puthoff holds patents in the area of lasers and optical devices, supervises research for Ph.D. candidates in Electrical Engineering and Applied Physics at Stanford University, has published a textbook in lasers widely used in universities both here and abroad, and has published over 25 papers in professional journals.

Prior to joining the staff of SRI, he accepted a position as Research Associate at the Microwave Lab and Lecturer in the Department of Electrical Engineering following receipt of his Ph.D. degree from Stanford in 1967. There he continued work in the field of lasers un he joined the staff of SRI in 1972. While at Stanford he conceived, patented, and develope a tunable Raman laser which produces high power radiation throughout the infrared portion the spectrum. In addition, he conceived and has under development a Cerenkov laser which h the potential of producing high power tunable coherent radiation from the far infrared into the ultraviolet portion of the spectrum.

From September 1963 to June 1967 he was enrolled as a student and employed as a research assistant in the Microwave Laboratory, Hansen Physics Lab, Stanford University, where he wa engaged in teaching and research in lasers and nonlinear optics.

Prior to entering Stanford, he graduated with the Master's degree from the University of Florida in 1960 and reported to active duty as a commissioned officer in the Navy to be assigned a research billet in the Department of Defense (NSA, Ft. Meade, Md.). While there he pursued research and monitored contracts concerned with the development of ultra-high-speed (kmc) computers under project LIGHTNING. He also served in the capacity of instruct for courses in analog computation. He also initiated a program to determine the potential of lasers, fiber optics, and other devices of this nature for use in optical and optoelectronic computers. His work in this area resulted in the award of a Department of Defense

Certificate of Commendation for Outstanding Performance. Upon being released from active duty in February, 1963, he remained in a civilian status (GS-13) until September, 1963, at which time he entered Stanford to pursue a Ph. D. program.

During the academic year 1958-59 he had an appointment as a Sperry Fellow while pursuing a Master's Degree program at the University of Florida. As part of his graduate program he designed, built, and tested an originally-conceived focusing system for hollow electron beams used in microwave tubes. For approximately one year prior to receiving the Master's degree, he was also employed full time by the R and D Laboratory of the Sperry Electronic Tube Division, Gainesville, Florida, where he was involved in similar research.

In the summer preceding graduate school, he was employed by the General Electric Company, Schenectady, New York, where he designed the logic system for a control computer for an automated steel mill, and, in addition, obtained a patent for the design of a remote control system for television receivers.

Harold E. Puthoff was born in Chicago, Illinois, on June 20, 1936. He began his professional career early by attending a vocational high school where he majored in Radio Communications, obtaining professional licenses which allowed him to work half-time throughout his undergraduate program at the university radio station. He received the B.E.E. Degree with High Honors in 1958 and the M.S.E. degree in 1960, both from the University of Florida, Gainesville.

LIST OF PUBLICATIONS

1. W.W. Peterson and H.E. Puthoff, "A Theoretical Study of Ion Plasma Oscillations IRE Elect. Devices ED-6, 372 (1959).
2. H.E. Puthoff, "Crossed-Field Focusing of a Hollow Cylindrical Electron Beam", M.S. Thesis, University of Florida, Gainesville, Florida, January 1960.
3. A.D. Sutherland, H.F. Renkiewicz, H.E. Puthoff, and D.E. Countiss, "On the Use of Periodic Electrostatic Focusing in Klystrons", Pres. Int. Congress on Microwave Tubes, Munich, West Germany, June 1960. Also pres. 18th Conf. on Electron Tube Research, Seattle, Washington, June 1960.
4. H.E. Puthoff, "Design of a Crossed-Field Electron Gun", Pres. 18th Conf. on Electron Tube Research, Seattle, Washington, June 1960.
5. H.E. Puthoff, "Scaling Matrix for the Analog Computer", NSA Tech. Jour. 7, 1962.
6. J.T. Tippett and H.E. Puthoff, "The Status of Optical Logic Elements for Nanosecond Computer Systems", Proc. Pacific Computer Conf., Pasadena, Calif. March 1963. Also published NSA Tech. Jour. 8 (1963).
7. J.T. Tippett and H.E. Puthoff, "Optical Computers Approach Reality", Optoelectronic Devices and Circuits, ed. by Samuel Weber, McGraw-Hill Co., New York, 266 (1964).
8. R.H. Pantell and H.E. Puthoff, "A Proposed Novel Method for Obtaining a Non-Spiking Pulsed Laser", IEEE 53, 295 (1965).
9. R.H. Pantell, P. Pheneger, and H.E. Puthoff, "Transient Buildup of Laser Oscillations", Pres. Spring Meeting Electrochemical Society, San Francisco, May 1965.
10. B. Huth, R.H. Pantell, and H.E. Puthoff, "Characteristics of a Tunable Raman Laser" Pres. Spring Meeting Electrochemical Society, San Francisco, May, 1965.
11. B. Huth, R. Pantell, and H. Puthoff, "The Effect of a Static Field on Raman Scattering", Pres. 23rd Conf. on Electron Device Research, Urbana, Ill., June, 1965.
12. H.E. Puthoff, R.H. Pantell, and B.G. Huth, "Tunability of the Raman Laser", Jour. Applied Physics 37, 860 (1966).
13. R.H. Pantell, B.G. Huth, H.E. Puthoff, and R.L. Kohn, "Mode Coupling in an External Raman Resonator", Appl. Phys. Letters 9. 104 (1966).
14. B.G. Huth, N.V. Karlov, R.H. Pantell and H.E. Puthoff, "A Study of the Stimulated Raman Effect Using an Off-Axis Resonator", Pres. 24th Conf. on Electron Device Research, Pasadena, Calif., June 1966.
15. B.G. Huth, N.V. Karlov, R.H. Pantell and H.E. Puthoff, "Characteristics of the Stimulated Raman Effect in an external Resonator", Proc. Sixth Int. Conf. on Microwave and Optical Generation and Amplification, Cambridge, England, Sept. 1966.
16. B.G. Huth, N.V. Karlov, R.H. Pantell, and H.E. Puthoff, "A Quantitative Study of the Stimulated Raman Effect Using an Off-Axis Resonator", IEEE J. Quant. Elect. QE-2, 763 (1966).

17. R. Pantell, F. Pradere, J. Hanus, and H. Puthoff, "Theoretical and Experimental Values for Two, Three, and Four Photon Absorptions", J. Chem. Phys. 46, 3507 (1967).

18. H.E. Puthoff, R.H. Pantell, B.G. Huth, and M.A. Chacon, "Near-Forward Raman Scattering in $LiNbO_3$", J. Appl. Phys. 39, 2144 (1968).

19. H.E. Puthoff, "The Stimulated Raman Effect and its Application as a Tunable Laser" Ph.D. Thesis, Stanford University, June, 1967.

20. R.H. Pantell, B.G. Hugh, and H.E. Puthoff, "Generation of Nonthreshold Second-Stokes Using an Off-Axis Resonator", IEEE J. Quant. Elect. QE-4, 41 (1968).

21. R.H. Pantell, G. Soncini, and H.E. Puthoff, "Stimulated Photon-Electron Scattering", IEEE J. Quant. Elect. QE-4, 903 (1968).

22. J. Gelbwachs, R.H. Pantell, H.E. Puthoff, and J.M. Yarborough, "A Tunable Stimulated Raman Oscillator", Appl. Phys. Letters 14, 258 (1969).

23. J.M. Yarborough, S.S. Sussman, H.E. Puthoff, R.H. Pantell, and B.C. Johnson, "Efficient Tunable Optical Emission from $LiNbO_3$ Without a Resonator", Appl. Phys. Letters 15, 102 (1969).

24. S.I. Wax, M. Chodorow, and H.E. Puthoff, "Optical Damage in KDP", Appl. Phys. Letters 16, 4 (1970).

25. S.S. Sussman, B.C. Johnson, J.M. Yarborough, H.E. Puthoff, R.H. Pantell and J. S J. Soolloo, "A New Source of Tunable Optical and Infrared Radiation", Proc. Polytechnic Institute of Brooklyn International Symposium of Submillimeter Waves, Mar. 1960, New York City, New York.

26. B.C. Johnson, H.E. Puthoff, J. Soolloo, and S.S. Sussman, "Power and Linewidth of Tunable Stimulated Far IR Emission in $LiNbO_3$", Appl. Phys. Letters, 18, 181 (1970).

27. E. Amzallag, T.S. Chang, B.C. Johnson, R.H. Pantell, and H.E. Puthoff, "Stimulated Raman and Polariton Scattering in $LiIO_3$", Jour. Appl. Phys. 43 3251 (1971).

28. D.L. Hecht, W.L. Bond. R.H. Pantell and H.E. Puthoff, "Dye Lasers With Ultrafast Transverse Flow", IEEE Jour. Quant. Elect. QE-8, 15 (1972)

BOOK: Fundamentals of Quantum Electronics, publ. by John Wiley and Sons, Inc., 1969. To be published in French by Dunod Co., Paris, France. A test and reference book bridging quantum mechanics to engineering and applied physics applications. Co-authored with R. H. Pantell.

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A. Introduction:

1. Objective:

The purpose of the proposed program is to demonstrate the feasibility of increasing extra sensory perception (ESP) by means of ESP teaching machines. In preliminary work we have found evidence suggesting that such learning does take place (Appendix A)*. At the present time, there is a very substantial literature describing carefully conducted experiments to demonstrate the existence of ESP. Many of these experiments have been examined, criticized, and verified by statisticians, biologists, and psychologists. In this proposal we will describe some of the experiments which have withstood the greatest scrutiny. It will not be the purpose of the proposed program to add to the literature another demonstration of the statistical appearance of ESP, but rather to train subjects to such a proficiency in ESP that their ability will be sufficient to allow us to go on and examine various models describing the operation of ESP.

It should therefore be understood that the authors elect to take the existence of ESP as an assumption upon which to base this proposal. Ultimately we would hope to obtain both an understanding of the ESP phenomena, and the skill to train subjects sufficiently to provide them with an ESP ability functioning at a useful operational level.

2. Background:

Preliminary

Over the past few years there has been an increase both in the quantity and the quality of successful ESP experiments appearing in the literature. This upswing is due in fair measure to the renewed interest in the subject in Soviet bloc countries. This proposal is motivated and partially based on a bringing together of three recurrent themes that we observe in the ESP papers of the past five years.

*Appendix A is a reprint of an invited paper presented at the IEEE International Symposium of Information Theory, January 1972. This paper summarizes our preliminary experiments giving evidence for increased ESP through use of feedback and reinforcement with an ESP teaching machine.

The papers referred to here will be referenced in detail in the body of this proposal.

One group of papers describe the well documented work of a Czech investigator, Dr. Milan Ryzl. His work, which has been examined by a large number of investigators from the West, involves a hypnotic teaching procedure for the induction of a high degree of ESP ability in subjects who had none previously. Ryzl's subjects have been among the most successful ever to be tested in the recent history of ESP research.

A second group of experiments done both in the U.S. and in the USSR shows that ESP ability is heightened by electrical screening of the percipient, contrary to what one might expect. In fact, the effect of electrical screening is one of the very few physical variables presently known that has any effect on ESP performance.

A third group of experiments pertains to the advisability of psychological reinforcement in ESP tests. It is apparent that through the history of ESP investigations, subjects who get no reinforcement in the testing procedure deteriorate in their ESP performance; those who receive reinforcement, improve. It is this latter group of experiments which suggests the use of a teaching machine with its demonstrated success in the teaching of other skills through the use of reinforcement techniques.

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Classical Experiments

Esp was not "discovered" in the laboratory; it was inferred from otherwise inexplicable happenings in everyday life; and in the latter part of the nineteenth century considerable effort was expended by the Society for Psychical Research (London) and other investigators to collect and document such cases. It soon became apparent, however, that these apparently inexplicable happenings were so intermixed with complex psychological events that it was impossible to decide whether any form of ESP had to be postulated to explain them. Therefore, laboratory experimentation was begun early in this century.

Laboratory experiments on ESP have dealt largely with statistical assessment of guessing procedures, where an exact level of "chance" expectancies can be specific. Subjects are asked to guess the identity of cards (ordinary playing cards or special decks), and elementary statistical procedures are used to test the null hypothesis that the number of correct identifications by the subjects is a chance fluctuation. When the results are improbable on the null hypothesis, the experimenter infers that that some form of ESP was operative. Elaborate and essentially foolproof precautions against both fraud and error have long been standard in laboratory tests, as well as physical arrangements precluding any sensory cues as to the identity of the target cards.

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Using these procedures, hundreds of experiments have now been reported from many laboratories, the vast majority of which have shown results which required rejecting the null hypothesis that only chance was operative. Some examples of such experiments will be given.

The Pratt-Woodruff (see Pratt, et.al., 1940)[1] series consisted of 60,000 guesses, using college students as subjects. The normal deviate of the results was 4.99, so that, on the null hypothesis of chance, such a result would be expected to occur approximately once in a million such experiments. Obviously, the null hypothesis must be rejected.

The Pearce-Pratt experiment (Pratt, et.al., 1940)[1] is one of the most rigorous ever conducted. A subject who appeared to be particularly gifted with ESP, judging from earlier experiments, Hubert Pearce, was asked to guess the identities of cards being looked at by the experimenter, Dr. Gaither Pratt. Dr. Pratt was in either of two buildings, 340 or 740 feet away from the subject during these trials. There were 1850 guesses. On the null hypothesis, the subject would be expected to make 370 hits. As a matter of fact, he made 558 hits. The probability of this occurring under the null hypothesis is 10^{-20}.

As a final example, one experiment from the extensive work of the English investigator, Dr. S. G. Soal, a mathematician at Oxford, will be illustrated. Using a gifted subject, Basil Shackelton, guessing runs were alternated through two conditions. In one case, an experimenter in a separate room looked at each card to be guessed (so-called telepathy conditions), while in the second case, this experimenter merely handled the same cards without looking at them, thus requiring the subject to somehow obtain information about the identity of the cards directly (so-called clairvoyance conditions). In this latter condition, the subject's calls did not deviate from chance expectancy. In the telepathy condition, however, the probability of the score having been obtained by chance was 5×10^{-9}. In other studies, this subject always scored well under telepathy conditions, but never under clairvoyance conditions (although, for the area as a whole, clairvoyance experiments have generally been as successful as telepathy experiments). This study (see Soal and Bateman, 1954)[2] and others illustrate

that some subjects may do well under certain experimental conditions and not others. Another successful series was conducted with Shackelton in Paris, while Soal looked at the cards in Oxford. Shackelton's guesses were checked against the actual card order by a third party in London, where the material was sent by each.

Research in the Soviet Union and Czechoslovakia

In 1962 a prominent Russian physiologist, Professor L. L. Vasiliev, published a book summarizing many years of experiments in ESP. An English translation appeared in 1963 (Vasiliev, 1963)[3]. Many of the experiments reported were carried out prior to the second World War, although special laboratories to study ESP have now been established under government auspices at Soviet universities (see Ivanov, 1963[4]; Pratt, 1963)[5]. One aspect of the Soviet experiments will be discussed later in section 3.4, and the bulk of the work will not be reviewed here. It should be noted, however, that there is an interesting difference in emphasis between Soviet research on ESP and research in the Western World. Our research has concentrated on asking subjects to guess at information, to find out things. The Soviets have concentrated on attempts to have subjects carry out telepathically-suggested actions at specific times. That is, our experiments have concentrated on "What is it?" while the Soviet experiments have concentrated on the command "Do it!" .

A particularly outstanding series of recent experiments have been performed by a Czech investigator, Dr. Milan Ryzl, both alone and in collaboration with several Western investigators (Pratt, 1964[6]; Pratt and Blom, 1964[7]; Ryzl and Pratt, 1963a[8]; 1963b[9]; 1963c[10]; Ryzl, 1962a[11]; 1962b[12]; Ryzl and Ryzlova, 1962[13]; Ryzl and Pratt, 1962[14]). These experiments are of particular interest since they all center around one outstanding subject who was trained by the hypnotic techniques to be described in section 3.3, and to be utilized in the proposed research. In all the experiments, the basic technique was to present to the subject a group of folders made of heavy cardboard. Inside each folder was a sealed envelope, and inside the envelope was a card which was green on one side, white on the other. Cards and protective coverings were thoroughly

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randomized before all experiments by two experimenters, in such a manner that neither the subject nor the experimenters could possibly know which envelope was in which folder or which side of the colored card was facing upward. The subject was asked to guess which side was upward.

In a typical experiment, carried out by a Dutch investigator, Professor J. Blom, and an American investigator, Dr. J. G. Pratt (Pratt and Blom, 1964)[7], the subject's guesses far exceeded chance expectation, the probability of the results having arisen from chance alone being 10^{-9}. The important thing about these experiments is that the subject had no ESP abilities before the hypnotic training, but as a result of it has continued to demonstrate ESP in experiment after experiment, despite the fact that the experimental guessing task must be excruciatingly boring after thousands of guesses!

<u>Psychological Factors Affecting ESP</u>

One of the most persistent results found in ESP research over the years has been the so-called decline effect (see Rhine and Pratt, 1957)[15]. This refers to the fact that subjects generally score above chance at the beginning of ESP tests, but decline to chance expectation toward the end. The null hypothesis of no ESP would allow for no such systematic trend. This was one of the earliest experimental indications of the importance of psychological factors affecting subjects' ESP performance, for such a decline curve is just what is obtained in almost any psychological study of repetitive tasks, i.e., subjects are enthusiastic and do well at first in almost any new task, but as fatigue and boredom set in, their performance declines.

The most systematic study of the psychological factors affecting ESP performance in America has been by Professor Gertrude Schmeidler. Much of her work has been summarized in a monograph (Schmeidler and McConnell, 1958)[16]. The basic psychological variable investigated by her has been the effect of subjects' belief in ESP on their scores during subsequent ESP testing. She has repeatedly confirmed the finding that, for groups of subjects, those who admit to a belief in ESP before the testing score significantly <u>above</u> chance expectation, while those who profess a disbelief in the reality of ESP score

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significantly below chance expectation. That is on an "unconscious" level the disbelievers must be using ESP in order to avoid making the correct guess. Furthermore, if personality measures of psychological adjustment, independently obtained, are compared with the beliefs and ESP scores, the above finding may be further refined. Thus the well-adjusted believers score significantly above chance expectation, and the well-adjusted disbelievers score significantly below chance expectation, while those subjects who are poorly adjusted score at chance levels, regardless of their belief. A striking demonstration of the way man structures his interaction with the world in accordance with his belief system!

Conclusions

The particular studies cited above are but a very small sample of many excellent studies. These studies are of such quality and significance that no scientist who studies the evidence can seriously doubt the existence of ESP. Given this fact, though, the question naturally arises as to why the phenomenon of ESP is not generally accepted in the scientific community.

There would seem to be three primary reasons for this nonacceptance. The first is that the effect, although real, is generally quite small in absolute terms. In the Pearce-Pratt experiment cited above, the subject averaged 7.5 hits per run of 25 guesses, instead of the 5 expected by chance. Although the odds against chance were astronomical (10^{-27}) for the entire series, this gain of 2.5 cards over chance expectation on the average is absolutely rather small.

A second reason for nonacceptance is similar to the first. The effect is not only generally small, but we are only beginning to barely understand the factors which determine whether or not it will appear at all in a given experiment. Thus while the bulk of experiments on ESP yield positive results, no one can be sure that a given subject will turn out positively, so ESP is not yet amenable to repeatable experiments, as phenomena in most other scientific disciplines are.

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The third, and perhaps most important, reason for nonacceptance, is that we have no adequate theories or explanations of ESP. As Dr. Charles Tart pointed out at the symposium on ESP at the University of California, Los Angeles, (Tart, 1965)[17] the total lack of fit of ESP phenomena with the current theoretical framework of physics causes most scientists to simply ignore their existence, and the small amount of scientific investigation of the phenomena in this country is not likely to result in any startling new discoveries that will force scientists to take notice of the phenomenon. This situation is quite regretable, for an understanding of ESP will undoubtedly result in significant additions to our knowledge of both physics and psychology, as well as having practical applications.

All branches of science progress through an interaction of theory and data. Data suggests theories, the theories suggest where to look for important data, and the new data confirms the theory or results in its modification. In general, the better our theoretical understanding of a phenomenon, the greater our control of it. The present status of ESP investigations reveals that we are trapped in a viscious circle; the low level of the phenomenon make adequate theorizing difficult, and the lack of adequate theories make it difficult to gain enough control to increase the magnitude of the ESP effect. It is in the hope of raising the level of the ESP effect that the research herein described is proposed, in order to have a quantum jump to a new and more fruitful level of investigation.

3. Rationale:

Introduction

In discussing possible techniques for increasing the attainable level of ESP performance, we find that there is little that may be said with great assurance. Most of the methods that have been tried in the laboratory over the past half century have centered around keeping the subject's interest and motivation at a high level. While some of these techniques have been successful, they have all been quite small scale effects, and obviously do not meet the need for the really effective enhancement of ESP performance necessary to acquire experimental control, and increase our understanding of the phenomenon.

This section will discuss the three techniques which we feel are not only suitable for investigation in our laboratory, but which do promise a significant enhancement of the ESP effect.

Learning and Reinforcement

The following is based on a paper by Tart.[18]

The assumption behind almost all ESP testing has been that we are trying to detect an extant capacity. It may be more profitable, however, to assume that whatever this capacity is, it is latent in the subjects, and they must learn to use this capacity within the context of the experimental situation. Let us now consider some basic facts about learning.

Learning refers to a postulated change within an organism (whether animal or human) which is reflected or manifested as a change (improvement) in performance during the course of practice at some task. Almost all learning takes place in situations where the correct response is rewarded on each trial and incorrect responses are not rewarded, or may even be punished. Thus someone attempting to learn to play the scales on a piano is rewarded by a smile from his teacher (and, perhaps, the satisfaction of the harmony) if he runs through it correctly, but by disapproval (and disharmony) if he is incorrect. Reward can, especially with human subjects, also be conceived of as feedback of information on the correctness or incorrectness of performance; and insofar

as the subject is motivated to perform correctly, knowledge that his response was correct is rewarding.

Now a number of factors affect the course of learning over and above the simple presence or absence of reward or feedback, such as the subject's motivation to learn and his state of health. A very important factor is the time relationship between the subject's response and the reward or feedback. Almost all studies of learning show that learning is slower and less effective as the interval between response and reward increases. With lower organisms, particularly, a fairly lengthy interval between response and reward results in no learning at all; i.e., the organism never emits the correct response with greater than chance frequency. In general, intervals between response and reward or feedback are optimal if they are on the order of less than a second, and learning falls off rapidly if these intervals reach even a few seconds in many instances.

The opposite of learning is extinction; i.e., the correct response in a situation appears less and less frequently, and finally fails to appear altogether. The typical laboratory procedure for producing extinction of a learned response is simply to stop rewarding each response as it is emitted by the organism. Or one can give the reward, but give it in a way such that it is ineffective for the particular organism, e.g., by making the response-reward interval so long that the organism no longer "associates" the reward with the correct response.

In this light, let us examine the typical card guessing situation, as used in almost all ESP experimentation. The subject comes in with some motivation to do well on this test (whether doing well means scoring positively for believers or scoring negatively for disbelievers). He is then required to give a large number of responses (guesses), usually 25, and some of these responses are correct, some are incorrect. The correct responses may occur with greater than chance frequency: in fact, they frequently do on the initial run. <u>After</u> he has emitted a large number of responses, the experimenter tells him which were correct and which incorrect. <u>There has been no reward or feedback immediately after each response</u>. Indeed, the feedback

coming after such a large number of trials is probably completely ineffective. What little reward there is (feeling gratified at scoring above chance) tends to be associated with the entire run, rather than individual responses. This paradigm, then, is basically an extinction paradigm, and is well suited to eliminate correct responses occurring with a greater than chance frequency.

Looking at the typical card guessing experiment introspectively, on each guessing trial the subject is responding to a whole host of internal cues, many of them probably not clearly represented in consciousness, and many of them probably extremely transient. In going over his results with him at the end of 25 trials, we are asking him to do a rather heroic task, i.e., to recall the particular set of amorphous feelings and sensations associated with each of the 25 trials, and to retrospectively associate these amorphous, transient feelings with this late knowledge of results.

Any psychologist, if asked to have any organism learn under conditions of massed, unrewarded trials followed by occasional rewards which cannot be associated with particular responses by the organism, will throw up his hands in despair!

Not only does the typical card guessing paradigm fit this theoretical model of the extinction paradigm, but the empirical results bear it out. Almost all subjects, no matter how much above chance expectancy they are at first, eventually, with repeated testing, come down to chance expectancy. We have, unknowingly yet systematically, been extinguishing the operation of ESP in our subjects. Indeed, one might cite as an argument for the existence and lawfulness of ESP, the fact that we are able to extinguish it by well-known psychological procedures. More positively, there has been one exploratory experiment appearing recently (Ojha, 1964)[19] which did report that subjects' scores at ESP tests increased in direct proportion to the amount of information feedback on each trial.

What can be done about it?

What is needed is an experimental procedure in which: (a) the subject's guesses have virtually immediate consequences, i.e., knowledge of results and/or reward and/or punishment on every trial; (b) the testing situation is intrinsicly motivating enough to the subject so that some ESP is operative

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in the first place; and (c) the mechanics of target selection, recording, and presentation of feedback, reward, or punishment are unobtrusive, so as not to distract the subject or the agent. Note that requirement (b) brings out an assumption basic to the argument of this paper, i.e., that the subject will utilize ESP in conjunction with some of his responses: otherwise, there is nothing to reinforce! That is, if a subject is simply guessing, immediate reinforcement of correct responses amounts to reinforcing randomly varying factors of no value, so there will be no learning to use ESP. If, on the other hand, a subject is using ESP in conjunction with some of his responses, this is a constant factor that will be reinforced, and we would expect learning to occur.

The techniques of immediate reinforcement are, of course, cumbersome to employ unless the procedure can be automated. A properly designed testing aid, which automatically generated random targets and scored the subject's responses, could easily be set up to do all of the following: (a) allow the subject to respond as slowly or rapidly as he wished, thus giving the subjects a chance to clarify their internal feelings and imagery, or to work rapidly, almost automatically; (b) reward the subject for correct responses, with fixed or variable intervals between response and reward, and on a constant or variable reward schedule; (c) provide reward as straight information feedback (a buzzer for correct responses, say) or provide something like coins falling from a dispenser on each correct response; or (d) punish the subject for incorrect responses, either in an informational feedback way, or by something like electric shock or monetary fines. Other techniques could be programmed in, but basically the point is that by the use of modern apparatus all the highly developed techniques of learning psychology and operant conditioning could be applied to guessing situations, and quite possibly we would find that subjects could learn to perform at more and more significant levels over time, instead of dropping off to chance.

A number of automated testing devices have been proposed in the past which produced random targets and automatically scored responses (Smith, et.al., 1963[20]; Stewart, 1959[21]; Taves, 1939[22]; Webster, 1949[23]). Unfortunately, most of these devices never saw any extensive use or refinement, nor were the

designers particularly aware of the concept of reinforcement: their emphasis was always on eliminating human error in recording responses. An interesting experiment using an automated testing procedure was conducted at the Air Force Cambridge Research Laboratories, but even here the investigators (Smith, et.al., 1963) were not aware of the value of reinforcement, and the device itself was quite large, complex, and undoubtedly overawing to the subjects. The development and refinement of automated testing devices is absolutely necessary if we are to turn guessing tests into a learning situation instead of an extinction procedure, however, as manual procedures for testing and reinforcement are simply too slow and cumbersome to both the subject and the investigator. The convenience afforded by automated testing devices in ESP research has been recognized by many, including the eminent English neurophysiologist, Grey Walter (Walter, 1965[24]), but the advantages gained by building in reinforcement contingencies are unique to this proposal.

Using Hypnosis to Enhance ESP

There has been occasional use of hypnosis in attempting to enhance ESP throughout the history of laboratory investigation (for typical recent studies, see Casler, 1962[25]; 1964[26]; LeCron, 1961[27]), but most of this has been a rather simple approach of simply telling hypnotized subjects that they will do better than they did without hypnosis. The experiments have generally reported some enhancement, but the enhancement has always been a small one in absolute terms.

The last five years have seen the development, by the Czech investigator, Milan Ryzl, of a systematic technique for using hypnosis as a method for training subjects to use their ESP capacities. The consistently positive and striking results obtained by one subject trained with this technique were described in section 2.3 above. Doctor Ryzl's training technique will now be outlined, based on his 1962 article (Ryzl, 1962[11]).

Ryzl reports that he has developed his training procedures in the course of working with 73 male subjects and 153 female subjects. Of these, he feels that 3 men and 24 women developed demonstrable ESP capabilities. His best woman subject, for example, was asked to guess at cards wrapped in opaque paper. The probability of her correct guesses being due to chance was 10^{-20}.

The first step in Ryzl's training procedure consists of hypnotizing the subject many times and having him experience a wide variety of hypnotic phenomena, such as amnesia for the events of the hypnotic state, hallucinations, dreams, motor inhibitions, etc. This familiarizes the subject with being in a hypnotic state, assures that he can reach a deep hypnotic state, and creates a positive set or attitude in him that hypnosis can produce many "miraculous" phenomena.

The next step in the training consists of using the hypnotic state to bring about a state of mental quiescence: that is, the normally continuous thought processes that we all have must be slowed and then stopped, so that the conscious mind becomes a "blank screen" upon which only phenomena suggested by the hypnotist appear. The subject is given training in seeing various internal hallucinations on this blank screen.

The training to develop ESP now begins. With the subject in a hypnotic state, eyes closed, and mind blank, Ryzl sets a tray in front of the subject containing some randomly picked object (note that these are training conditions, <u>not</u> test conditions). Ryzl then suggests that the subject will find an image appearing in his mind, and that the image will be of the object on the tray. When the subject reports that he has a clear image, and reports on the various properties of the image (e.g., distinctness, vividness, any emotional or somatic feelings associated with it, etc.), Ryzl has him immediately open his eyes and compare his fresh image with the actual object. The authors of this proposal feel that this is a very important aspect of the training, for this immediate confrontation of image and reality allows the subject immediate feedback, and the chance to begin discriminating the characteristics of images which do convey ESP information from those which do not.

The remainder of Ryzl's training procedures consist of refinement of the subject's ESP abilities, rather than any new procedures, and will only be briefly sketched here. They consist of: (a) continued practice in mental quiescence and hallucinating, in order to make all images more distinct; (b) placement of the target objects further and further away from the subject, eventually in distant rooms; (c) gradually allowing the subject to become less dependent on the hypnotist by letting the subject initiate, control, and

terminate his own hypnotic trances; and (d) having the subject practice his new-found ESP abilities in a normal waking state, so the hypnosis is eventually completely eliminated.

The essence of Ryzl's technique, then, is an instrumental use of hypnosis to train his subjects to develop vivid images or hallucinations against a background of mental quiet, and to gradually learn (through immediate feedback) to discriminate images conveying ESP information from those which do not, and finally to carry this skill over to the waking state.

Although the best subject resulting from Ryzl's training has now been investigated by several Western scientists, as discussed in section 2.3, no independent confirmations of the technique have been published as of this date.

Several university scientists in the United States and England hope to investigate Ryzl's techniques in the near future, if financial support is forthcoming. Whether Soviet investigators are working on this is unknown, as the Soviets seem to be quite reticent about what their current investigations of ESP are. We believe that a technique of such promise calls for independent confirmation as soon as possible.

Effects of Electromagnetic Shielding on ESP

Although we have no adequate theories or models of how ESP operates, the hypothesis that it is a form of electromagnetic radiation has long appealed to many people. Indeed, telepathy has often been called "mental radio."

The electromagnetic theory has received no experimental support, however. Two examples from the Soviet work will be cited, although there is no attempt here to discuss the electromagnetic theory in detail. Vasiliev (1963[3]) reports several experiments where long distances were used (hundreds of kilometers) between the subject and the sender in telepathy studies, and the distance seemed to have no effect on the results.

Of more interest, however, were the many experiments conducted by Vasiliev, specifically to test the electromagnetic theory, where highly effective shielding was placed around the subject. This consisted of placing the subject inside a sealed Faraday cage, constructed from thick sheets of lead. This excluded all but extremely long electromagnetic waves or intense hard radiation. The results

showed that there was no effect on the subject's significant ESP performance. Thus, whatever the physical nature of the information transfer mechanism in ESP, it seems unaffected by shielding.

A far more intriguing effect of placing subjects in Faraday cages has been noted in some privately-circulated material by an American neurologist, Dr. Henry Puharich. He conducted an extended research program in ESP, using gifted subjects, in which the subjects were eventually put in separate Faraday cages or one subject was in a solid copper sheet Faraday cage while another was in a car. In a crucial experiment using this latter condition (the subject in the car was thus one mile from the laboratory), the subjects' scores on a matching test were such that the probability of the results being due to chance was 2×10^{-19}. The fact of real importance, however, is that the subjects had never been known to score at such a high level of significance when they were not in the shielded Faraday cage. Further exploratory research indicated that the electrical conditions of the Faraday cage significantly affect the level of ESP scoring. Breaking the integrity of the shielding, or disconnecting the ground connection of the cage from earth, for example, dropped the subjects' scoring levels back to those obtained under ordinary room conditions. The changes in the physical parameters of the Faraday cage were done, of course, without the subjects' knowledge, in order to avoid psychological suggestion effects.

The Faraday cage thus seems to have the effect of a physical amplifier of ESP, increasing the level of ESP performance by an order of magnitude. If the effect is confirmed, the next step of investigation is to ascertain just what physical properties of the Faraday cage are responsible for the effect. For example, what portions of the electromagnetic spectrum are effectively shielded?

The Faraday cage effect in enhancing ESP is quite novel, and currently inexplicable. It is in direct opposition to an electromagnetic hypothesis of ESP. A possible explanation of the effect, however, might center around the fact that the electromagnetic fields normally impinging on human beings may inhibit or otherwise interfere with the operation of ESP. Doctor Allen Frey, for instance, has conducted research showing that human subjects are

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capable of detecting and reacting to incident electromagnetic radiation in certain portions of the spectrum (Frey, 1961[28]; 1965[29]). Thus, the Faraday cage might enhance ESP by shielding out the "noise" of electromagnetic radiation.

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B. Specific Aims:

Introduction

In the light of the technical discussion above, we propose to investigate the feasibility of enhancing ESP function using the following three approaches: (1) use of a teaching machine for ESP, incorporating the principle of reinforcement; (2) training subjects to use ESP by means of hypnotic techniques; (3) testing the effect of Faraday cages on enhancing ESP performance. Toward the end of the experimental program, it is hoped to find optimal combinations of all three approaches, although time considerations may make it necessary to carry out this synthesis of approaches in a subsequent year.

C. Methods of Procedure:

Description of ESP Teaching Machines Available for Use on this Program

In order to accomplish the ends set forth in Section III, teaching machines having the following characteristics have been developed:

(1) Generates completely random targets automatically and rapidly.

(2) Possess flexibility as to the nature of the targets generated, i.e., be able to select various sorts of targets of interest to the subjects, which may be more complex than simply the internal state of an electronics circuit.

(3) Able to present target to a person acting as sender in a telepathy experiment.

(4) Allows the subject to respond as rapidly or as slowly as he wishes.

(5) Automatically scores and permanently records both the targets generated and the subject's responses.

(6) Provides informational feedback and/or reinforcement to the subjects immediately following each response.

(7) Provides no sensory cue as to its internal state.

(8) Is self-powered, so that it may be used inside a Faraday cage without breaking the integrity of the cage by bringing in power lines.

(9) Is highly reliable in operation, as well as tamper-proof, so that there is no need for an experimenter to stay with the machine.

Devices meeting these criteria have been designed and built by the authors of this proposal. This proposed research will bring improved versions of these designs to the hardware stage, debug them, and test a large number of subjects.

The teaching machines will be available at the start of the project. At that time at least two of the machines will be installed in prominent locations at SRI, and employees will be invited to try their skill on them. Various psychological techniques will be employed, such as offering prizes for the best subjects, to keep interest high. In this manner, it should be possible to collect data on hundreds of enthusiastic subjects within a few months. This will not only provide information on the feasibility of teaching ESP to unselected subjects, but also will allow a screening for the best subjects with whom further experimentation will be done.

Effect of Faraday Cage on ESP Performance

The initial step in this aspect of the research program will be the evaluation of a Faraday cage, physically similar to the one used by Puharich in the research discussed in section 3.4 above. The research will then follow two lines, carried out concurrently.

First, the physical characteristics of the Faraday cage will be assessed for our application. Shielding effects throughout the electromagnetic spectrum, acoustical properties, etc. will be investigated, using the full resources of Stanford Research Institute.* Since we do know know what characteristics of the Faraday cage are essential to the purported effect and which are not, a broad survey of its physical properties is what is being carried out here.

Second, subjects will be run in ESP tests within the Faraday cage. Unselected subjects will be run on conventional ESP guessing tests at the beginning of this effort. As results from the teaching machine program come in, the subjects who did best at that will be the ones used in the Faraday cage experimentation. The teaching machine has been designed to be self-powered, so that it may be used in the cage without breaking the integrity of the shielding. The machine itself will be electronically shielded, so as not to introduce a source of interference into the Faraday cage.

Throughout the Faraday cage tests, various physical parameters of the cage will be systematically varied without the subjects' knowledge (to avoid psychological effects). For example, the electrical integrity of the Faraday cage can be varied by removing a section of the shielding for some studies -- this will be done so as to be imperceptible to the cage, because of the inner, wooden wall. Other effects from varying cage parameters will be studied if there does seem to be an ESP enhancement effect.

The outcome of this aspect of the proposed research should be an objective assessment as to whether the Faraday cage can enhance ESP, as reported; and, if so, some indication of what the crucial parameters of the Faraday cage are. In answering this latter question, valuable data may also be obtained on the nature of information transfer in ESP.

*SRI Faraday cage for use on this program

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Hypnotic Enhancement of ESP

The basic procedure to be followed here is the same as that outlined in section 3.3, where Ryzl's work was discussed, with some improvements.*

Ryzl's training technique is inherently long. It requires at least 20-40 hours of time from a psychologist skilled in the use of hypnosis, as well as the subject's time. An immediate improvement, then, is to save time by going through the training procedure only with subjects who are highly hypnotizable, a group comprising about 20% of the general population. It is possible to assess reliably a subject's hypnotizability by standard psychological techniques which require about one hour to administer. The Stanford Hypnotic Susceptibility Scale, Form C, is one of the best instruments (Weitzenhoffer and Hilgard, 1963[30]). Thus the training time will be spent with those subjects who show the maximum hypnotic potential.

A second improvement in Ryzl's procedure will consist of using subjects who are preselected for ESP capacity. The hypnotic training program will thus be coordinated with the teaching machine program: those subjects who score significantly well on the teaching machine and/or show that they are learning to use ESP on the teaching machine will be used in the hypnotic training (provided they also show a reasonable level of hypnotic aptitude).

Preference in training, then, will be given to those subjects who show both significant ESP performance and a high level of hypnotic aptitude. Subjects who show a very high performance on one screening, but not the other, will also be worked with.

Considerable psychological data on the nature of hypnosis and its feasibility in enhancing ESP will be generated by this aspect of the experimental program.

*Dr. Ryzl is now living in the San Francisco Bay area and is available to participate in this research.

Integration of Separate Research Lines

Although it cannot be predicted how much time will be available near the end of the research period to devote to integration of the three research lines, it is hoped that sufficient time will be available to provide at least initial answers as to the feasibility of combining the three approaches for maximal enhancement of ESP performance.

Some of the possible lines of integration have been mentioned in the preceding sections. These and others include: (1) using subjects who score well on the teaching machine project as the subjects for the other projects; (2) conducting some of the hypnosis training in the Faraday cages; (3) modifying the hypnotic training to focus specifically on the teaching machine targets; and (4) pursuing any promising leads that may very well come up in an exploratory project.

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D. Significance:

Demonstration of increasing scores on guessing the state of random target selector would, for the first time in the field of parapsychology, indicate that ESP ability can be learned and/or enhanced. Further, such a result correlated with the reinforcement technique would show that so-called ESP phenomena fall within the same learning paradigm as more conventional physical and psychological phenomena.

In addition, a positive demonstration of enhancement of such extraordinary human perception would indicate the achievement of volition over subtle physical/psychological processes and as such would extend further understanding of the area broadly referred to as visceral learning.

Finally, with the aid of a proven learning technique based on feedback reinforcement, knowledge of the extraordinary human perception faculty would be brought within the realm of observational science and so permit further training and utilization of the faculty.

E. Facilities Available:

Stanford Research Institute (SRI) is an independent, nonprofit organization performing a broad spectrum of research under contract to business, industry, and government. The Institute, which was formerly affiliated with Stanford University, was founded in 1946. Its operations include the physical and life sciences, industrial and development economics, management systems, engineering systems, electronics and radio sciences, information science, urban and social systems, and various combinations of disciplines within these fields.

SRI has no endowment; payments by clients under research contracts and grants amount to approximately $65 million annually and are used to cover all operating costs. Such revenue also helps the Institute maintain the excellence of its research capabilities.

SRI's facilities include more than one million square feet of office and laboratory space, and incorporate the most advanced scientific equipment, including unique instrumentation developed by the staff. The bulk of these facilities and most of the research staff are located at the Institute's headquarters in Menlo Park, California. Regional office locations include Washington, D.C.; New York City; Chicago; Houston; and Los Angeles.

Of SRI's total staff of 2600, approximately one-half are in professional and technical categories. Some 400 members of the professional staff have Ph.D. or equivalent degrees; 600 others have their Master's degree.

The project leader and the other research personnel who would be active in the proposed work are members of the Electronics and Bioengineering Group. This group currently occupies 5000 square feet of laboratory space, divided into seven separate laboratory rooms, a technicians' work area, a machine shop, and a computer room housing a LINC-8 and related terminals and equipment. In addition, there is available a well equipped computation center.

The Electronics and Bioengineering Laboratory employs a number of technicians and engineering assistants and has available electronics material and test equipment useful in the development and testing of the teaching machines. Especially suited to the work described in the proposal are a number of shielded rooms with various instrumentation available.

Finally, there is a backup team of psychologists and statisticians which can be brought into the project on an internal consulting basis.

APPENDIX: LEARNING CLAIRVOYANCE AND PRECOGNITION WITH AN EXTRA SENSORY PERCEPTION TEACHING MACHINE

by

Russell Targ and David B. Hurt

ABSTRACT

Feedback reinforcement techniques have been used to teach extrasensory perception. A machine which randomly selects among four targets, provides immediate feedback indicating correctness of subjects' determination of the machine chosen target. The machine can make its choice either before or after the subject has made his determination, with learning observed to take place in both cases.

The research reported here demonstrates the feasibility of increasing the extra sensory perception (ESP) of some subjects by means of an ESP teaching machine. At the present time, there is a substantial body of literature describing carefully conducted experiments to demonstrate the existence of ESP.[1-3] It is not our purpose to add another demonstration of the statistical appearance of ESP, but rather to demonstrate that learning can take place.

The teaching machine used in this work was designed with the goal of enhancing the ESP ability which we believe to be a latent capacity to some extent in all people.[4] Our hypothesis is that enhancement can be accomplished by allowing the user of the machine to become consciously aware of his own mental state at those times when he is most successfully employing his extra sensory faculties. With increased conscious awareness of this mental state, we believe that he is then able to bring his otherwise intermittent faculties under his volitional control.

The teaching machine we used, generates four random targets for the user to choose. These targets are generated by the machine and are not presented until the user has indicated to the machine what he believes the target to be. The targets are 35 mm color transparencies and the user's task is to select the one the machine has chosen by means of its random target generator.

An important feature of the machine is that the choice per se of a target is not forced. That is, the subject may press a PASS button on the machine when he wishes not to guess. Thus, with practice the user can learn to recognize those states of mind in which he can correctly choose the target. He does not have to guess at targets when he truly does not feel that he "knows" which to choose.

When the PASS button is pushed the machine indicates what its choice was, and neither a hit nor a trial is scored by the machine which then goes on to make its next selection. We consider this elimination of forced choice to be a significant condition for learning ESP.

When the user of the machine indicates his choice to the machine, he is immediately and automatically informed of the correct answer. The machine described here is being used to enhance clairvoyant perception in which experimenter and the subject remain ignorant of the machine's state until the subject has made his choice.

Because the user obtains immediate information feedback as to the correct answer, he is able to recognize his mental state at those times when he has made a correct response. If the information feedback to the user were not immediate, we believe as much learning would not take place and less or no enhancement would be achieved. The machine used in this work is shown in Figure 1.

The machine has the following general properties:

It generates random targets automatically and rapidly., with the rate determined by the user. It automatically records and scores both the user's responses and the targets generated. The machine provides no sensory cue to the user as to its internal state, and its randomness has been carefully investigated.[5] The machine has four stable internal states. A 1.0 MHz square-wave oscillator sends pulses to an electronic counter that counts from "one" to "four". On the fifth pulse, the counter returns to "one". This is called a "scale of four counter". The machine therefore passes through each of its four states at a rate of 250,000 times per second. The state in which the scale of four counter resides is determined by the length of time the 1 MHz oscillator runs. Once the machine is in a fixed state (not scaling), the user indicates his choice as to which state he thinks the machine is in by pressing a button on the machine under the color slide of

his choice. The correct slide will then light up. The correct answer for the next choice is determined by the length of time the choice button was held down in making the selection. Since the scaling rate is 250 KHz, there is no way for the user to control the final state of the machine since his reaction time is four orders of magnitude too slow for this. In addition to the reward of having pushed the button under the slide which lights, a bell rings to indicate that a correct choice was made, and four lights carrying messages of encouragement are lit sequentially as the subject obtains 8, 10, 12 and 14 hits.

In the course of this work we have encountered three general classes of subjects. The majority of the 12 subjects working with the machine in this study did not show any significant improvement in their ESP ability. Three of the subjects gave indirect evidence of increased ESP by guessing at targets in a manner to cause their scores to become bi-modal. Whereas chance scores should give a skewed binominal distribution, with the probability of a "hit" at each trial equal to 1/4, we observe that several subjects show an increasing deviation from this distribution. That is, they generate a disproportionate number of high and low scores. This variance of scoring patterns has been noted in the ESP literature.[6] Among these subjects a particularly high score such as 12 out of 24 is often followed by a particularly low score such as 2 out of 24. We interpret this variance pattern as an indication of ESP although it is not an effect which we set out to cultivate.

In the group indicating some improvement, one subject has shown an exceptional increase in ESP scores through more than 1600 trials. This subject has apparently learned to clairvoyantly perceive the state of the machine to an extent providing a significant deviation from chance expectation.

The protocol for the experiment was for the subject to make four runs of 24 trials, (P=1/4). This was followed by a rest period, and four more runs of 24.

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The most successful subject in this experiment reached a scoring level where on three occasions she scored more than 40 hits out of 96 trials in one of these sets of four runs, where only 24 hits would be expected. From the null hypothesis, the probability of 40 hits out of 96 trials is less than 10^{-3}, (CR = 3.77). This subject made a total of 64 runs of 24 trials with a mean score of 8.6 hits per run. (CR = 9.81, P for the whole series $<10^{-15}$).

Based on the outcome of this work, we sought to determine if other phenomena in the ESP realm could be similarly enhanced.

The machine was altered so that the target was not chosen by the machine until after the subject indicated his choice. The time delay was approximately 0.2 second, which is to say that subjects were asked to make a perception of an event which was to occur 0.2 second in the future.

The single subject, graduated to the precognitive experiment reported at the beginning of her first run, "I don't feel anything anymore," about which picture would light, and moreover that she was "just guessing." This was borne out in her early scores in the precognition experiment. However, in the course of 672 trials, her performance increased to a level approaching her scores in the clairvoyant test; e.g., she obtained 19 hits out of her first 96 trials and 38 hits out of her last 96 trials. The results of the 28 precognitive runs of 24 trials each were subjected to a linear regression analysis in blocks of 96, corresponding to experimental protocol. The data is shown in figure 2, and gives a best fit to a line with positive slope 0.56 per run of 96, and a Y intercept of 20.0. The correlation coefficient was 0.68. (P <0.01) This is a clear indication that learning has taken place.

We conclude from this work that it may be possible to teach and enhance ESP phenomena through techniques of feedback and reward in much the same was as visceral and glandular functions are brought under volitional control.[7]

Additional experiments will shortly be undertaken to find the relationship between accuracy of precognition and the temporal distance from the event.[8] Our overall goal is to achieve an understanding of the functional relationship of ESP to the various physical and psychological variables which control it.

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5. The distribution of targets with regard to singles, doubles and triples was analyzed for 2400 trials, and was found to lie within one standard deviation of the expected value.

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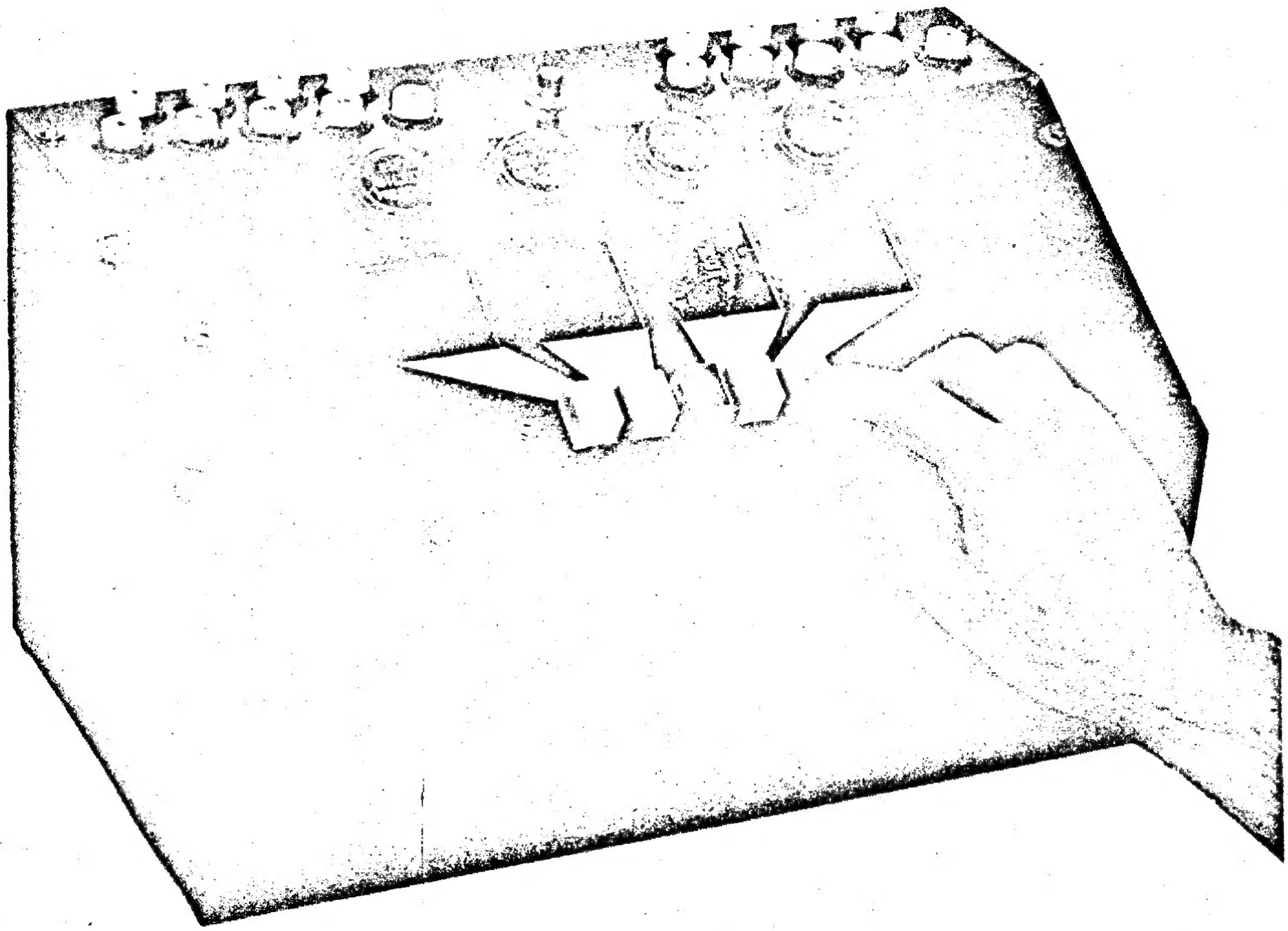
8. We hypothesize that significant events create a perturbation in the space-time in which they occur, and that this disturbance propagates forward, and to small degree, backward in time. Since precognitive phenomena are quite rare, the disturbance evidently dies out extremely rapidly in the -t direction.

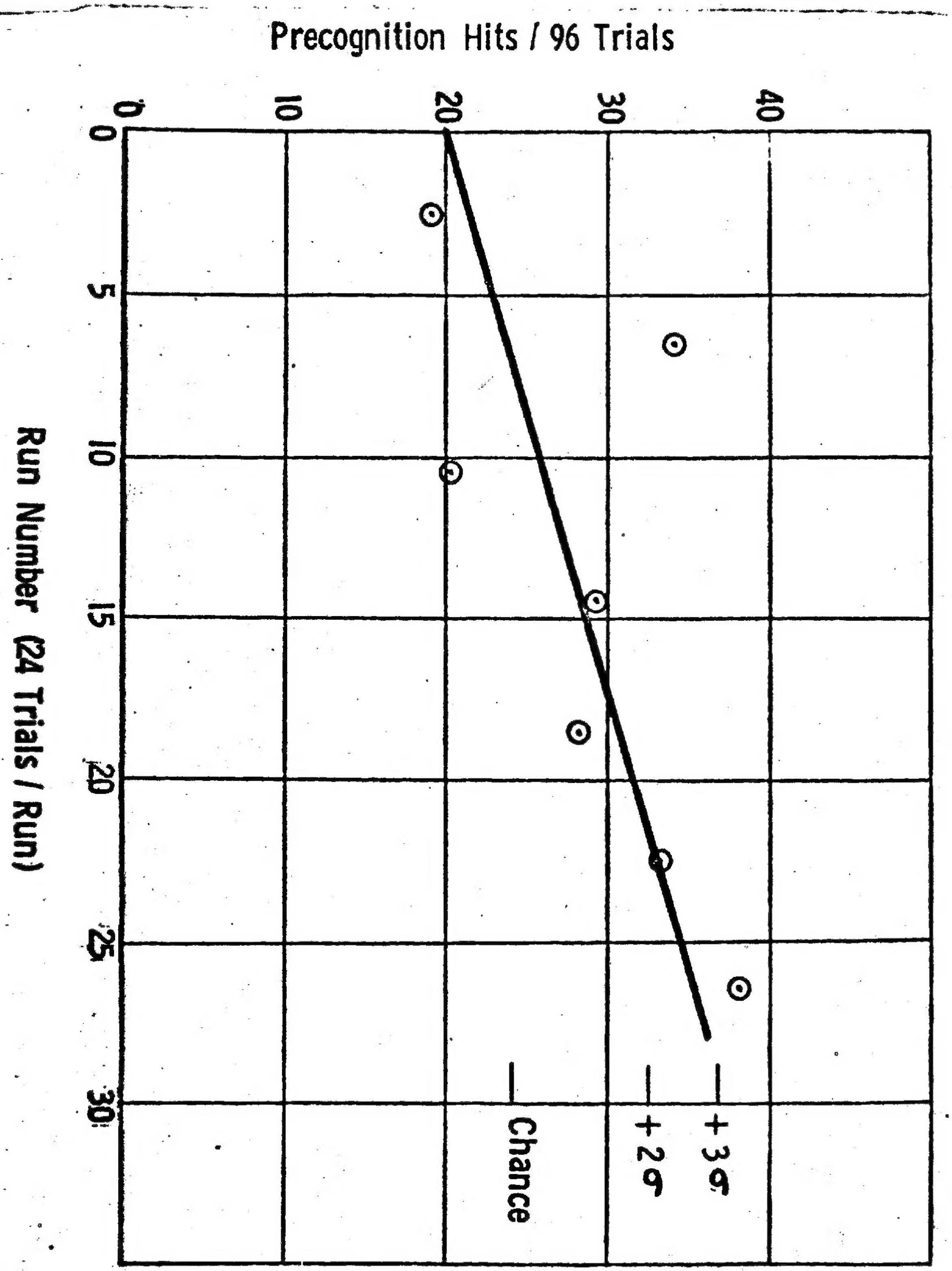
9. This work was supported by a grant from the Parapsychology Foundation.

FIGURE CAPTIONS

1. ESP Teaching Machine used in this Experiment, with two of the four "encouragement-lights" illuminated.

2. Precognition Experiment; showing number of hits/run of 96 trials vs. average trial number. Linear regression analysis of the data is also shown. Correlation coefficient = 0.68, $P < 0.01$.




Precognition Hits / 96 Trials
0
10
20
30
40
Run Number (24 Trials / Run)
0
5
10
15
20
25
30
+3σ
+2σ
Chance